MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2320
Gaithersburg, Maryland 20899-2320

SRM Number: 978a
MSDS Number: 978a
SRM Name: Assay-Isotopic Standard for Silver

Date of Issue: 03 December 2004

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Description: Standard Reference Material (SRM) 978a is intended for use as an assay and isotopic standard. Each unit of SRM 978a consists of 0.25 g of silver nitrate, $AgNO_3$, made from high purity silver metal and high purity nitric acid.

Substance: Silver Nitrate

Other Designations: **Silver Nitrate** (nitric acid, silver (1+) salt; silver (1+) nitrate; silver mononitrate; nitric acid silver (I) salt; silver (I) nitrate)

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component:	**Silver Nitrate**
CAS Number:	7761-88-8
EC Number (EINECS):	231-853-9
SRM Nominal Concentration (mass %):	100
EC Classification:	C, N
EC Risk (R No.):	34, 50, 53
EC Safety (S No.):	1, 2, 26, 45, 60, 61

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0–4): Health = 3 Fire = 0 Reactivity = 0

Major Health Hazards: Respiratory tract burns, skin burns, eye burns, mucous membrane burns.

Potential Health Effects

Inhalation: Inhalation (acute exposure) may cause severe burns of the mucous membranes. Symptoms include sore throat, coughing, shortness of breath, and lung damage. Prolonged exposure, 2 to 25 years, may result in argyria, an irreversible blue-gray discoloration, of the skin or mucous membranes.

Skin Contact: Dust and solutions may cause severe irritation, burns, ulceration, and discoloration. Prolonged contact may cause argyria of the skin, described in prolonged inhalation exposure.

Eye Contact: Eye contact may cause irritation, burns, and discoloration. Acute exposure may also result in rapid appearance of edema of the conjunctiva and lids. Permanent cornel opacification, loss of epithelium, and blindness may result. Prolonged contact may result in conjunctivitis and discoloration of the cornea without injury or irritation to the eyes.

Ingestion: Ingestion may cause pain and burning in the mouth, throat, and epigastrium. Toxic effects include salivation, violent abdominal pain, black vomitus, diarrhea, anuria, collapse, shock, convulsions, coma, and death. The fatal dose in humans has been as low as 2 g. Although recovery has occurred following ingestion of larger doses, 10 g is usually fatal.

Listed as a Carcinogen/ Potential Carcinogen:	Yes	No	
		X	In the National Toxicology Program (NTP) Report on Carcinogens.
		X	In the International Agency for Research on Cancer (IARC) Monographs.
		X	By the Occupational Safety and Health Administration (OSHA).

4. First Aid Measures

Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing by qualified personnel. Get immediate medical attention.

Skin Contact: Rinse affected area with copious amounts of water for at least 15 minutes while removing contaminated clothing. Get immediate medical attention. Destroy contaminated shoes. Thoroughly clean and dry contaminated clothing before reuse.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: Get immediate medical attention.

5. Fire Fighting Measures

Fire and Explosion Hazards: Silver nitrate is a negligible fire hazard. Silver nitrate is an oxidizing material that may ignite or explode on contact with combustible materials.

Extinguishing Media: Do **NOT** use dry chemicals, carbon dioxide or halogenated extinguishing agents. Use water or extinguishing agents most appropriate for surrounding fire.

Fire Fighting: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): Not applicable.
Method Used: Not applicable.

Autoignition Temp. (°C): Not applicable.

Flammability Limits in Air
UPPER (Volume %): Not applicable.
LOWER (Volume %): Not applicable.

6. Accidental Release Measures

Occupational Release: Avoid contact with combustible materials. Do **NOT** touch spilled material. Collect small spilled material in an appropriate container for disposal.

Reportable Quantity: Spills and releases of silver nitrate to soil, water, and air that are subject to reportable quantities (RQ) under Title III of SARA are greater than the unit quantity provided for SRM 978a. See Section 15, "Regulatory Information".

Disposal: Refer to Section 13, "Disposal Considerations".

7. Handling and Storage

Storage: Store and handle in accordance with all current regulations and standards (NFPA 430, Code for the Storage of Liquid and Solid Oxidizers). Store in a tightly closed container. Keep separated from incompatible materials.

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection".

8. Exposure Controls and Personal Protection

Exposure Limits: **Silver Nitrate**
Silver, Soluble Compound (Ag)
ACGIH (TLV): 0.01 mg/m^3 TWA
OSHA (PEL): 0.01 mg/m^3 TWA
NIOSH: 0.01 mg/m^3 (10 h) recommended TWA
OES UK: 0.01 mg (Ag)/m^3 TWA

Ventilation: Use a local exhaust ventilation system. Ensure compliance with applicable exposure limits.

Respirator: For conditions of frequent use or heavy exposure where exposure is apparent and engineering controls are not feasible, respirator protection may be needed. Refer to the "NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84" for selection and use of respirators certified by NIOSH.

Eye Protection: Wear safety goggles. Do **NOT** wear contact lenses in the laboratory. An eye wash station should be readily available near areas of use.

Personal Protection: Wear appropriate protective clothing and chemically resistant gloves to prevent skin exposure.

9. Physical and Chemical Properties

Component: **Silver Nitrate**

Appearance and Odor: Clear. Solid. Colorless. Odorless.

Relative Molecular Weight: 169.87 g/mol

Molecular Formula: $AgNO_3$

Density: 4.35 g/cm^3

Solvent Solubility: Soluble in ether, glycerol. Very slightly soluble in alcohol and acetone.

Water Solubility: Soluble.

Melting Point: 212 °C

10. Stability and Reactivity

Stability: X Stable _____ Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid contact with combustible materials. Silver nitrate may ignite or explode on contact with combustible materials. Keep out of water supplies and sewers.

Incompatible Materials: Silver nitrate is incompatible with combustible materials, metal carbide, bases, halogens, acids, peroxides, metals, metal salts, and reducing agents.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Oxides of nitrogen.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

11. Toxicological Information

Route of Entry: X Inhalation X Skin X Ingestion

Toxicity Data: Man, Unreported LD_{Lo}: 29 mg/kg
Rat, Oral LD_{50}: 1173 mg/kg
Rat, Intraperitoneal LD_{50}: 83 mg/kg

Mutagenic, Tumorigenic Reproductivie Data: Investigated as a tumorigen, mutagen, and reproductive effector.

Health Effects (Acute and Chronic): See Section 3: "Hazards Identification" for potential health effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:
Fish, Mottled sculpin (Cottus bairdi) LC_{50} (mortality): 13.6 µg/L, 96 h
Invertebrate, Water flea (Daphnia magna) EC_{50} (immobilization): 1.03 µg/L, 48 h
Algal, Red algae (Champia parvula) MATC (reproduction): 7.2 µg/L, 14 h
Phototoxicity, Waterweed (Elodea canadensis) EC_{50}: 100 µg/L, 24 weeks
Other, Common Indian toad (Bufo melanostictus) LC_{50} (mortality): 4.1 µg/L, 96 h

Environmental Summary: Highly toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations. Subject to disposal regulations, U.S. EPA 40 CFR 262, Hazardous Waste Numbers D001, D011. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the regulatory level of 5.0 mg/L.

14. TRANSPORTATION INFORMATION

U.S. DOTand IATA: Silver nitrate; UN1493; Hazard Class 5.1; Packing Group II.

Canadian Transportation or Dangerous Goods: Silver nitrate; UN1493; Class 5.1; Packing Group/Risk Group II.

Land Transport ADR and RID: Silver nitrate; UN1493; Class 5.1, Classification Code C02; Packing Group II.

Maritime Transport: Silver nitrate; UN1493; Class/Division 5.1; Packing Group II.

15. REGULATORY INFORMATION

U.S. Regulations:
CERCLA Sections 102a/103 (40 CFR 302.4): Silver nitrate: RQ 0.454 kg (1 lb)
Note: The quantity specified is greater than the unit quantity provided in SRM 978a.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Silver compounds.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	Yes.
CHRONIC:	No.
FIRE:	Yes.
REACTIVE:	No.
SUDDEN RELEASE:	No.

CANADIAN Regulations: WHMIS Classification: Not determined.

EUROPEAN Regulations

EC Classification:

C	Corrosive.
N	Dangerous for the environment.

EC Risk Phrases:

R34	Causes burns.
R50/53	Very toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

EC Safety Phrases:	S1/2	Keep locked-up and out of reach of children.
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
	S45	In case of accident or if you feel unwell, seek medical advice immediately (show label if possible).
	S60	This material and/or its container must be disposed of as hazardous waste.
	S61	Avoid release to the environment.

National Inventory Status

U.S. Inventory (TSCA): Listed on inventory.

TSCA 12 (b) Export Notification: Not listed.

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Silver Nitrate,* 19 March 2003.
Handbook of Chemistry and Physics, 69th ed., CRC Press.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.